The Observations and Studies on NEOs and SL9 Impact at PMO, China

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Since 1964, a systematic asteroid search and study in China have been led by Y. C. Zhang, the former director of the PMO (the Purple Mountain Ob servatory), and Jiaxiang Zhang. Using a 40-cm double astrograph, over one hundred numbered asteroids and three comets have been found. Two of those asteroids are Mars-crossers ([2077] Kiangsu and [2078] Nanking), discovered by Jiaxiang Zhang, Jiexing Yang, Qi Wang and their colleagues.

In 1987, a systematic program for NEO's search and study was proposed by Sichao Wang. Thereafter, Qi Wang, Yongliang Ge and other astronomers of the PMO went to use the 60cm Schmidt telescope at the Xinglong Station of the Beijing Observatory several times. The field of the telescope is 4.8°. Since the stereo pair technique on plate and the star plate comparator were used, the comet Ge-Wang and the fast moving object 1991 BH have been found by Yongliang Ge and Qi Wang, both of who joined the International Near-Earth Asteroid (INAS) in 1988. Meanwhile they have been studying the survey strategy. Now the difficulty is that the available observation time is very limited.

In addition to the search of NEOs, using their numerically self-established dynamical model for objects of solar system, exploring method and making software, Jiaxiang Zhang and his colleagues provided the July 7 edition of heliocentric orbital elements and impact prediction of the SL9, as well as the jovicentric positions and velocities of the nuclei before impact. The last astrometric data used in those solutions were up to the date of 1994 July 2. This edition was sent to the mail exploder for observers of SL9 impact and was listed as the latest addition on July 11, 1994. The predictions mainly matched with actuality. Using the 1-m reflector with CCD at the Yunnan Observatory, the accurate position observation of Icarus was made and the orbit research of some unusual NEAs (including Icarus and 1989 FC) was studied by Jiaxiang Zhang and his colleagues.

During the period between July 13 and September 14, 1994, the optimum impact and post-impact period, using the 60cm reflector (f=10m) which is attached by the MTV 1881 EX CCD video camera with R filter and without filter, the observations of Jupiter were made by Sichao Wang et al. Over 800 thousand images of Jupiter have been recorded on the metal tapes of high quality by the M2 video recorder and over 900 images of Jupiter have been sampled by the multimedia computer. During the period between July 18 and September 14, the dark spots induced by the nuclei G, H, K, L, Q1, R, S and W of the comet Shoemaker-Levy 9 were monitored. The characterisics of the size, central nucleus with ring-like structure and low albedo of the dark spots suggest the following interpretation:

- The spots could be produced by a high- altitude cloud in the stratosphere and the cloud is consisting of dark articles and other materials that have condensed from the impact plume.
- The southern dark feature could be caused by splash- back dark articles and other materials of the plume.

Yuehua Ma et al. have carried out computer simulation on the ablation and dissociaion of the comet SL9 when entering the jovian atmosphere. The comet fragments were modeled as 10^{12}, 10^{13}, and 10^{14} kg with density of 3.0, 1.0, 0.8, 0.5 and 0.2g/cm^3, respectively. Their results show that these fragments explode below the ammonia cloud layer, near the 1-bar level, explaining the observation of ammonia without water. Finally, their simplified explosive model estimates that these explosions can lift the material in the atmosphere up to 8000 km high above the top cloud layer of the jovian atmosphere as observed, the angle of the covering area of the ejecta to the Jupiter's center is about 10°.

Recently, the shock effects of the high velocity impacts among solid bodies in the solar system have been studied by Sichao Wang, Pinxin Xu and Jianming Wang and the collision frequencies between 41 Aten-Apollo-Amor objects and the Earth have been calculated by J. H. Lu.

The impact of comet SL9 on Jupiter has resulted in a great attention and public interest in NEOs in China and the PMO has recently proposed a new plan to install an about 1 meter telescope with a 2048*2048 CCD equipment in 2-3 years at the PMO's station, about 400 kms north of Nanjing where it is promising to have fine weather and low light-pollution. We do hope that the station with such a powerful instrument at the indispensable longitude of east 8-hour time zone in Asia can be set up, before long, to make contribution to the international NEO's survey.